10/609

Generate Collection Print

L8: Entry 1 of 1 File: USPT Feb 12, 2002

US-PAT-NO: 6347265
DOCUMENT-IDENTIFIER: US 6347265 B1

TITLE: Railroad track geometry defect detector

DATE-ISSUED: February 12, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Bidaud; Andre C.	Burnaby			CA

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Andian Technologies Ltd.	Burnaby			CA	03

APPL-NO: 09/594286 [PALM]
DATE FILED: June 15, 2000

PARENT-CASE:
This application claims the benefit of U.S. Provisional Application Nos. 60/139,217, filed Jun. 15, 1999, and 60/149,333, filed Aug. 17, 1999.

INT-CL-ISSUED: [07] B61 L 23/04

US-CL-ISSUED: 701/19; 73/146
US-CL-CURRENT: 701/19; 73/146

FIELD-OF-CLASSIFICATION-SEARCH: 701/19, 73/146
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
3638482	February 1972	Schubert	73/146
4005601	February 1977	Botello	73/146
4691565	September 1987	Theurer	73/146
4741207	May 1988	Spangler	73/146

☐	4793577	December 1988	Austill et al.	246/107
☐	4880190	November 1989	Austill et al.	246/107
☐	5440923	August 1995	Arnberg et al.	
☐	5956664	September 1999	Bryan	702/184
☐	5987979	November 1999	Bryan	73/146
☐	6044698	April 2000	Bryan	73/146
☐	6125311	September 2000	Lo	701/29

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	CLASS
0561705	September 1993	FR	

ART-UNIT: 3661

PRIMARY-EXAMINER: Zanelli; Michael J.

ASSISTANT-EXAMINER: Gibson; Eric M

ATTY-AGENT-FIRM: Fay, Sharpe, Fagan, Minnich & McKee, LLP

ABSTRACT:

A track analyzer included on a vehicle traveling on a track includes a vertical gyroscope for determining a grade and an elevation of the track. A rate gyroscope determines a curvature of the track. A speed determiner determines a speed of the vehicle relative to the track. A distance determiner determines a distance the vehicle has traveled along the track. A computing device, communicating with the vertical gyroscope, the rate gyroscope, the speed determiner, and the distance determiner, a) identifies a plurality of parameters as a function of the grade, elevation, and curvature of the track, b) determines in real-time if the parameters are within acceptable tolerances, and, c) if the parameters are not within the acceptable tolerances, generates corrective measures.

17 Claims, 14 Drawing figures

Previous Doc Next Doc Go to Doc#

L8: Entry 1 of 1 File: USPT Feb 12, 2002

DOCUMENT-IDENTIFIER: US 6347265 B1
TITLE: Railroad track geometry defect detector

Abstract Text (1):
A track analyzer included on a vehicle traveling on a track includes a vertical gyroscope for determining a grade and an elevation of the track. A rate gyroscope determines a curvature of the track. A speed determiner determines a speed of the vehicle relative to the track. A distance determiner determines a distance the vehicle has traveled along the track. A computing device, communicating with the vertical gyroscope, the rate gyroscope, the speed determiner, and the distance determiner, a) identifies a plurality of parameters as a function of the grade, elevation, and curvature of the track, b) determines in real-time if the parameters are within acceptable tolerances, and, c) if the parameters are not within the acceptable tolerances, generates corrective measures.

Brief Summary Text (9):
A track analyzer included on a vehicle traveling on a track includes a vertical gyroscope for determining a grade and an elevation of the track. A rate gyroscope determines a curvature of the track. A speed determiner determines a speed of the vehicle relative to the track. A distance determiner determines a distance the vehicle has traveled along the track. A computing device, communicating with the vertical gyroscope, the rate gyroscope, the speed determiner, and the distance determiner, a) identifies a plurality of parameters as a function of the grade, elevation, and curvature of the track, b) determines in real-time if the parameters are within acceptable tolerances, and, c) if the parameters are not within the acceptable tolerances, generates corrective measures.

Brief Summary Text (11):
In accordance with another aspect of the invention, an analog-to-digital converter converts analog signals from the vertical gyroscope, the rate gyroscope, the speed determiner, and the distance determiner into respective digital signals which are transmitted to the computing device.

Drawing Description Text (11):
FIG. 9 illustrates a distance determiner according to the present invention;

Drawing Description Text (14):
FIG. 12 illustrates a graph of degree-of-curvature versus distance according to the present invention;

Detailed Description Text (12):
With reference to FIG. 9, a distance determiner (e.g., an odometer) 91 includes first and second light sources 100, 102, respectively, and first and second light detectors 104, 106 (e.g., photocells), respectively, positioned near slots 110 in first and second plates 112, 114, respectively, along an axis 92 including the wheel 78. The distance determiner 91 acts to measure distance that the vehicle 28 travels. The plates 112, 114 are preferably positioned such that a slot 110 in the first plate 112 "leads" a slot 110 in the second plate 114 by about 1 degree,

thereby forming a quadrature encoder.

Detailed Description Text (13):
With reference to FIGS. 1 and 8-10, electrical pulses 116, 118 are received by the detectors 104, 106 when light from the sources 100, 102 passes through the slots 110 in the respective plates 112, 114. The space between each of the slots 110 is known. Furthermore, each of the plates 112, 114 rotates as a function of the distance the vehicle travels. As indicated by the dotted lines in FIG. 10, the pulses 116, 118 are out-of-phase by about 1 degree. The electrical pulses 116, 118 are transmitted from the detectors 104, 106 to the computing device 42, which determines the distance the vehicle 28 has moved as a function of the number of pulses produced. Also, the direction in which the vehicle 28 is moving is determined by whether the phase of the first plate 112 leads/lags the phase of the second plate 114.

Detailed Description Text (14):
The distance is preferably determined in one of two ways. The distance determiner 91 requires the vehicle 28 to start at, and proceed from, a known location. For example, the vehicle 28 may proceed between two (2) "mile-posts." Alternatively, a differentially corrected global positioning system ("GPS") is used with vehicles where manual intervention is not available. More specifically, the position of the vehicle 28 is obtained from the GPS. Then, the distance determiner 91 is used to update the position of the vehicle 28 between the GPS transmissions (e.g., if the vehicle is in a tunnel).

Detailed Description Text (16):
With reference to FIGS. 1 and 11, a degree-of-curve is defined as an angle a subtended by a chord 120 (e.g., 100 foot). The distance determiner discussed above is used to calculate the chord 120 distance. Also, the rate gyro and speed determiner discussed above are used to determine the degree-of-curve. More specifically, the rate gyro 50 (see FIG. 4) and the speed determiner 70 (see FIG. 6) may determine a certain rate in degrees/foot. That rate is then multiplied by the length of the chord 120 (e.g., 100 feet), which results in the degree-of-curve. The degree-of-curve represents a "severity" of a particular curve in the track 10.

Detailed Description Text (17):
FIG. 12 represents a graph 121 of degree-of-curvature versus distance. As a vehicle enters/exits a curve in a track (see, for example, FIG. 5), the degree-of-curvature changes. While the vehicle is on straight track (e.g., a tangent) or in the body of a curve having a constant radius, the degree-of-curvature remains about constant 122, 123, respectively. A point 124 represents a beginning of an entry spiral; a point 125 represents an end of the entry spiral/beginning of a curve; a point 126 represents an end of the curve/beginning of an exit spiral; and a point 127 represents an end of the exit spiral. The entry and exit spirals represent transition points between straight track and the body of a curve, respectively. Determining whether the vehicle is on a straight track (tangent), a spiral, or a curve is important for determining what calculations will be performed below.

Detailed Description Text (22):
4) Maximum Allowance Runoff (MAR) Tolerances that, when exceeded, identify potentially unsafe uniform rise/falls in both rails over a given distance.

Detailed Description Text (25):
As discussed above, tangents are identified as straight track. Curves correspond to a body of a curve, i.e., the constant radius portion of a curve. Warp-in-tangents and curves are calculated as a maximum difference in cross-level along a length of track (e.g., 62' of track) while in a tangent section or a curve section. This calculation is made as the vehicle moves along the track. This calculated parameter is then compared to the data (e.g., engineering tables) discussed above, which is preferably stored in the look-up tables. A determination is made as to whether the

current section of the track is within specification. If the section of track is identified as not being within specification, a message is produced and the offending data is noted in an exception file.

Detailed Description Text (26):
Warp in spirals are calculated as a difference in cross-level between any two points along a length of track (e.g., 31' of track) in a spiral. The data is also calculated as the car moves along the track. This calculated parameter is compared to the data stored in the look-up tables for determining whether the section of track under inspection is within specification. If the section of track is identified as not being within specification, a message is produced and the offending data is noted in the exception file.

Detailed Description Text (34):
The variations in the cross-level are related to speed. The designation is the "legal freight speed" for a section of track. This designation is defined in another set of tables, which relate freight speed to actual track position (mileage). Therefore, the system is able to determine the distance (mileage) and, therefore, looks-up the legal track speed for that specific point of track. The system is able to determine whether the vehicle is on tangent (straight) track, curved track, or spiral track from the graph shown in FIG. 12. An example of calculations for tangent (straight) track are discussed below.

Detailed Description Text (35):
To determine whether the vehicle is on tangent (straight) track, curved track, or spiral track, the system takes a snap-shot of all the parameters at one foot intervals, as triggered by the distance determiner. Therefore, the system performs such calculations every foot. The data are then statistically manipulated to improve the signal-to-noise ratio and eliminate signal aberrations caused by physical bumping or mechanical "noise." Furthermore, the data are optionally converted to engineering units.

Detailed Description Text (36):
More specifically, at a given time (or distance), if the vehicle is on a tangent (straight) track and traveling 40 mph with an actual cross elevation of 11/8", the system first determines an allowable deviation, as a function of the speed at which the vehicle is moving, from the look-up table including data for urgent defects (UD1). For example, the allowable deviation may be 11/2" at 40 mph. Since the actual cross elevation is 11/8" and, therefore, less than 11/2", the cross elevation is deemed to be within limits.

Detailed Description Text (46):
The instrument box senses (picks-up) the geometry information and converts it so that it is suitable for processing by the computing device. The Hirail is also equipped with both a speed determiner and a distance determiner. In the Hirail configuration, the computing device is mounted in a convenient place. The driver of the vehicle is easily able to view the computer monitor when optionally notified by a "beeping" noise or, alternatively, a voice generated by the computer. If the frame is a locomotive, the computer is placed in a clean, convenient location.

CLAIMS:

1. A track analyzer included on a vehicle traveling on a track, the track analyzer comprising:

a vertical gyroscope for determining a grade and an elevation of the track;

a rate gyroscope for determining a curvature of the track;

a speed determiner for determining a speed of the vehicle relative to the track;

a distance determiner for determining a distance the vehicle has traveled along the track; and

a computing device, communicating with the vertical gyroscope, the rate gyroscope, the speed determiner, and the distance determiner, for a) identifying a plurality of parameters as a function of the grade, elevation, and curvature of the track, b) determining in real-time if the parameters are within acceptable tolerances, and, c) if the parameters are not within the acceptable tolerances, generating corrective measures.

3. The track analyzer as set forth in claim 1, further including:

an analog-to-digital converter for converting analog signals from the vertical gyroscope, the rate gyroscope, the speed determiner, and the distance determiner into respective digital signals which are transmitted to the computing device.

10. A method for analyzing a track on which a vehicle is traveling, comprising:

determining a grade and an elevation of the track;

determining a curvature of the track;

determining a speed of the vehicle relative to the track;

determining a distance the vehicle has traveled along the track;

identifying a plurality of parameters as a function of the grade, elevation, and curvature of the track;

determining in real-time if the parameters are within acceptable tolerances; and

if the parameters are not within the acceptable tolerances, generating corrective measures.

16. The method for analyzing a track on which a vehicle is traveling as set forth in claim 10, wherein the step of determining the distance includes:

producing light from a first source;

passing the light through a plurality of slots in a first plate which rotates as a function of the distance the vehicle travels relative to the track, a spacing between the slots being known;

producing first electrical pulses when light from the first source passes through the slots and is received by a first detector; and

determining the distance the vehicle has traveled along the track as a function of a number of the first pulses received by the first detector.

17. The method for analyzing a track on which a vehicle is traveling as set forth in claim 16, further including:

producing light from a second source;

passing the light from the first and second sources through a plurality of slots in a the first plate and a second plate, respectively, which rotate as a function of the distance the vehicle travels relative to the track, the slots in the first plate being offset a predetermined amount from the slots in the second plate;

producing second electrical pulses when light from the second source passes through the slots and is received by a second detector; and

determining a direction the vehicle is traveling along the track as a function of the first and second electrical pulses.

Previous Doc Next Doc Go to Doc#

L13: Entry 3 of 3 File: USPT Nov 2, 1999

US-PAT-NO: 5978718
DOCUMENT-IDENTIFIER: US 5978718 A

TITLE: Rail vision system

DATE-ISSUED: November 2, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kull; Robert C.	Olney	MD		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Westinghouse Air Brake Company	Wilmerding	PA			02

APPL-NO: 08/898648 [PALM]
DATE FILED: July 22, 1997

PARENT-CASE:
CROSS-REFERENCE TO RELATED APPLICATIONS This application is related to a copending U.S. application entitled INTEGRATED CAB SIGNAL AND RAIL NAVIGATION SYSTEM, Ser. No. 08/898,373, filed currently herewith on Jul. 22, 1997. The copending application is assigned to the assignee of the present invention, and its teachings are incorporated into the present document by reference.

INT-CL-ISSUED: [06] B61 L 3/00, B61 L 29/00

US-CL-ISSUED: 701/19; 701/20, 246/167R, 340/937
US-CL-CURRENT: 701/19; 246/167R, 340/937, 701/20

FIELD-OF-CLASSIFICATION-SEARCH: 701/19, 701/20, 246/167R, 246/182R, 246/122R, 340/902, 340/937
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
5415369	May 1995	Hungate	246/167R
5452870	September 1995	Heggestad	246/182R

☐	5620155	April 1997	Michalek	340/902
☐	5699986	December 1997	Welk	246/125

ART-UNIT: 361

PRIMARY-EXAMINER: Nguyen; Tan

ATTY-AGENT-FIRM: James Ray & Associates

ABSTRACT:

A rail vision system visually reads signal aspect information from each wayside signal device of a wayside signaling system. It also warn a train operator of the more restrictive signal aspects and imposes a penalty brake application should the train operator fail to acknowledge the warning. Each wayside signal device communicates from a railway operating authority information including directions as to how the train should proceed along the upcoming segment of railway track. The rail vision system includes a signal locating system and a rail navigation system. The signal locating system isolates visually the upcoming wayside signal device and reads the information therefrom as the train approaches thereto. The rail navigation system determines the position that the train occupies on the railway track and provides the signal locating system with data as to the whereabouts of the upcoming wayside signal device relative to the position of the train. This enables the signal locating system to isolate visually the upcoming wayside signal device and to provide the information read therefrom to the rail navigation system. The rail navigation system can then warn the train operator of the more restrictive signal aspects, and should the train operator fail to acknowledge the warning, impose a penalty brake application.

21 Claims, 2 Drawing figures

Previous Doc Next Doc Go to Doc#

Hit List

First Hit | Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Search Results - Record(s) 1 through 3 of 3 returned.

☐ 1. Document ID: US 20030225490 A1

L13: Entry 1 of 3 File: PGPB Dec 4, 2003

PGPUB-DOCUMENT-NUMBER: 20030225490
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030225490 A1

TITLE: Method and system for compensating for wheel wear on a train

PUBLICATION-DATE: December 4, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Kane, Mark Edward	Orange Park	FL	US
Shockley, James Francis	Orange Park	FL	US
Hickenlooper, Harrison Thomas	Palatka	FL	US

US-CL-CURRENT: 701/19; 702/85

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

---

☐ 2. Document ID: US 6701228 B2

L13: Entry 2 of 3 File: USPT Mar 2, 2004

US-PAT-NO: 6701228
DOCUMENT-IDENTIFIER: US 6701228 B2

TITLE: Method and system for compensating for wheel wear on a train

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

---

☐ 3. Document ID: US 5978718 A

L13: Entry 3 of 3 File: USPT Nov 2, 1999

US-PAT-NO: 5978718
DOCUMENT-IDENTIFIER: US 5978718 A

TITLE: Rail vision system

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Terms	Documents
L12 AND (701/19).CCLS.	3

Display Format: - Change Format

Previous Page Next Page Go to Doc#

First Hit Previous Doc Next Doc Go to Doc#

End of Result Set

Generate Collection Print

L24: Entry 1 of 1 File: DWPI Jun 19, 1986

DERWENT-ACC-NO: 1986-162883
DERWENT-WEEK: 198626

TITLE: Car bonnet or boot lid - hinges in plates sliding away from window on opening

INVENTOR: HOFFMANN, G

PATENT-ASSIGNEE: BAYERISCHE MOTOREN WERKE AG (BAYM)

PRIORITY-DATA: 1984DE-3445812 (December 15, 1984)

Search Selected Search ALL Clear

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
DE 3445812 A	June 19, 1986		017	
DE 3569008 G	April 27, 1989		000	
EP 185246 A	June 25, 1986	G	000	
EP 185246 B	March 22, 1989	G	000	

DESIGNATED-STATES: DE FR GB IT DE FR GB IT

CITED-DOCUMENTS:No-SR.Pub; DE 1216134 ; DE 2651410 ; DE 3315129 ; EP 141145

APPLICATION-DATA:

PUB-NO	APPL-DATE	APPL-NO	DESCRIPTOR
DE 3445812A	December 15, 1984	1984DE-3445812	
EP 185246A	December 4, 1985	1985EP-0115362	

INT-CL (IPC): B62D 25/12; E05D 3/06; E05D 7/00

ABSTRACTED-PUB-NO: DE 3445812A
BASIC-ABSTRACT:

The car has a bonnet or boot lid (1) hinging at the edge (3) nearest to the adjacent window up and down in bearing plates (4). Each plate slides in a guide rail (5) in the lengthwise direction of the car, there being a gear train (6,7) coupling the lid edge to the rail, to slide the plate away from the window for a predetermined amount on opening and back again on shutting.

The train can be uncoupled with the lid open. This allows the plate to slide for a further amount away from the window, it being then possible to let the lid down again.

USE - Combines compactness with easy access to window for replacement.

ABSTRACTED-PUB-NO: EP 185246B
EQUIVALENT-ABSTRACTS:

A rear or front flap hinge of a passenger car, in which the edge (3) of the front or, more especially, the rear flap (1) near the adjacent window (2) of the passenger car is pivotable upwards and downwards on a hinge mounting plate (4) which is displaceable lengthwise of the vehicle in a guide, and gear means (toothed segment 6, pinion 7, lower rack 8) engaging the hinged plate (4) are located between the guide and the edge (3) of the flap pivoted to the hinge mounting plate (4) and are used to displace the hinge mounting plate (4) positively by a predetermined amount (a) when the flap (1) is pivoted upwards in the direction away from the window (2) and when the flap (1) is pivoted downwards in the direction towards the window, characterised in that the gear connection between the pinion (7) and the rack (8) is disengageable by means of a gap adjacent the rack (8) which enables the pinion (7) to free-wheel, as a result of which the hinge mounting plate (4) is displaceable through an additional distance (b) by moving the pinion (7) in the direction away from the window (2). (11pp)

CHOSEN-DRAWING: Dwg.4/10

DERWENT-CLASS: Q22 Q47

Previous Doc Next Doc Go to Doc#